Bulletin No. 60 January 15, 1923.

COMMONWEALTH OF PENNSYLVANIA

DEPARTMENT OF INTERNAL AFFAIRS
James F. Woodward, Secretary

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GEOLOGIC STRUCTURE OF THE PITTSBURGH QUADRANGLE, PA.

By

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The Pittsburgh quadrangle is named after the city of Pittsburgh which, with its suburbs, covers the northwest quarter of the area. The quadrangle is oblong in shape, 13¼ miles wide and 17¼ miles long, with a total area of about 227 square miles. The Monongahela and Youghiogheny rivers meet about at the middle of the quadrangle, and the Monongahela and Allegheny at Pittsburgh. The town of Elizabeth is 1½ miles north of the southern boundary of the quadrangle; Trafford City nearly bisects the eastern boundary.

The quadrangle is thickly populated and transportation facilities are excellent. River boats, good roads, trolley lines and railroads, all help in the movement of passengers and freight.

The field work necessary for the preparation of a geologic structure sheet and other maps, was done in the summer and fall of 1921 and 1922. Much of the structure in the southwestern half of the quadrangle is based on mine levels and plane-table work. The structure in the northeastern half is based chiefly on barometric and hand-level elevations. These latter were checked at short intervals against known elevations, and it is believed that the structure is everywhere correct within the contour interval used.

In a general way, the geologic structure of the Pittsburgh quadrangle is like that of the greater part of western Pennsylvania. The rocks have been folded in such a way that the major anticlines and synclines have a northeast-southwest trend. Named in order from northwest to southeast, these structures are: McMurry syncline, Amity anticline, Duquesne syncline, and Murrysville anticline. A description of them follows.

McMurry Syncline. A broad gentle trough at the head-waters of Lick Run (one mile north of Broughton) has a branching axis. The main

branch of this syncline extends north through Carrick and the city of Pittsburgh. Just north of the U. S. Arsenal property the axis veers to the east along the south bank of Allegheny River and the syncline broadens and rises rather sharply, losing its identity beyond Aspinwall. A minor branch of the syncline extends through Hillock toward Hays and about follows the course of Streets Run. The Pittsburgh coal is well beneath the surface near Broughton (elevation 870 feet where the axis of the syncline crosses the western boundary of the quadrangle) but the rise in the structure soon brings the coal to the surface and in downtown Pittsburgh it occurs only in the high hills.

Amity Anticline. The axis of the Amity anticline crosses the western boundary of the quadrangle two miles west of Snowdon and extends (with many bends) through Wallace, Homestead and Edgewood to Verona. South of Hays the anticline undulates, several domes occurring along the crest. North of Hays the crest rises and beyond White Ash (now called Sandy Creek) this rise is quite rapid. The anticline is far from straight and has many kinks and minor folds along its flanks. It is not so pronounced a structure as the Murrysville anticline to the east.

Duquesne Syncline. This syncline takes its name from the city of Duquesne through which it passes. Its southern end is in the Brownsville quadrangle on the south. The axis of the syncline crosses the southern boundary 1-3/4 miles east of Gastonville; crosses Peters Creek about three-fourths of a mile east of the mouth of Lick Run; touches the west side of Monongahela River at Camden; passes through Duquesne, Turtle Creek and Trestle (now called Center), and crosses the eastern boundary of the quadrangle about one mile northeast of the last-named village. The syncline has a fairly uniform pitch to the south and lowers the Pittsburgh coal from an altitude of 1200 feet at New Texas to 780 feet at the southern boundary. At Turtle Creek the main structure branches, minor folds extending to the east, north and northwest. A narrow trough 25 feet deep in the syncline west of Coal Valley is apparently of local occurrence only. Between Dravosburg and East Pittsburgh the pitch of the syncline is very low and probably this flattening of the structure caused the accumulation of small pools of gas at McKeesport and East Pittsburgh. At Linhart and to the north, a prominent nose in the structure very likely accounts for the small oil pool near that village. A similar but less prominent nose in the structure east of Turtle Creek explains the presence of oil in wells sunk on the Boyd farm (east of Turtle Creek and north of Wilmerding).

Murrysville Anticline. This anticline is the most pronounced structural feature in the quadrangle. It rises rapidly towards the northeast and raises the Pittsburgh coal from an altitude of 875 feet at the southern boundary of the quadrangle, to 1200 feet at Versailles. Here the pitch becomes much more gentle and this flattening of the structure probably caused the large accumulation of gas in the Speechley sand at Versailles. The anticline extends almost due northeast beyond Versailles, the axis crossing the eastern boundary of the quadrangle one mile south of Trafford City. Here the horizon of the Pittsburgh coal (the coal has been eroded) is 1280 feet above sea-level.

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Southeast of Robbins Station and Buena Vista the structure is comparatively flat, a deep and narrow trough near Cowansburg being the only pronounced feature. A similar but less prominent trough crosses the southern boundary of the quadrangle about two miles west of Scott Haven and extends in a northwest direction towards Wiley Run.

INFLUENCE OF STRUCTURE IN THE ACCUMULATION OF OIL AND GAS

ADVICE ON LOCATION OF FUTURE WELLS.

If the generally accepted theory of the origin of oil and gas be taken as correct, it is easy to understand how, when the tiny globules of oil, gas and water migrated up the dip of the sandstone beds, the gas would tend to occupy the highest parts of the structures encountered, while the oil would be found farther down. Thus, in the long migration up the Duquesne syncline, the gas would tend to work up the flanks of the adjacent anticlines till they reached a lodging point near the top of those structures, while the oil would be pushed ahead of the water until it was either trapped by some structure such as that at Linhart, or else until a point of equilibrium was reached where the water no longer moved up structure. The 1175 and 1225 foot structure contour lines seem to represent about the top of the water "drive" up the Duquesne syncline. Nearly all of the producing oil wells in this and the Greensburg quadrangle to the east lie within the area enclosed between these structure contour lines.

If the above explanation be correct, then there is little prospect of finding any more oil pools in the Duquesne syncline. The search for a further supply of oil should be concentrated in the small areas as yet untested between the above mentioned structure lines in this and the Greensburg quadrangle. Personally, the author feels that a further search for oil in the Duquesne syncline would not be a very profitable undertaking.

Chances of finding oil in the McMurry syncline are even slimmer than of finding new pools in the Duquesne syncline. The McMurry syncline is a smaller and weaker structure, and it is believed that any oil which might exist in the Hundred Foot or Speechley sands (the two oil-producing sands in the Duquesne syncline) would be so scattered that its commercial extraction would be impossible. To recapitulate, conditions are unfavorable for (1) the presence of much oil in the sands, (2) the accumulation of that oil in pools.

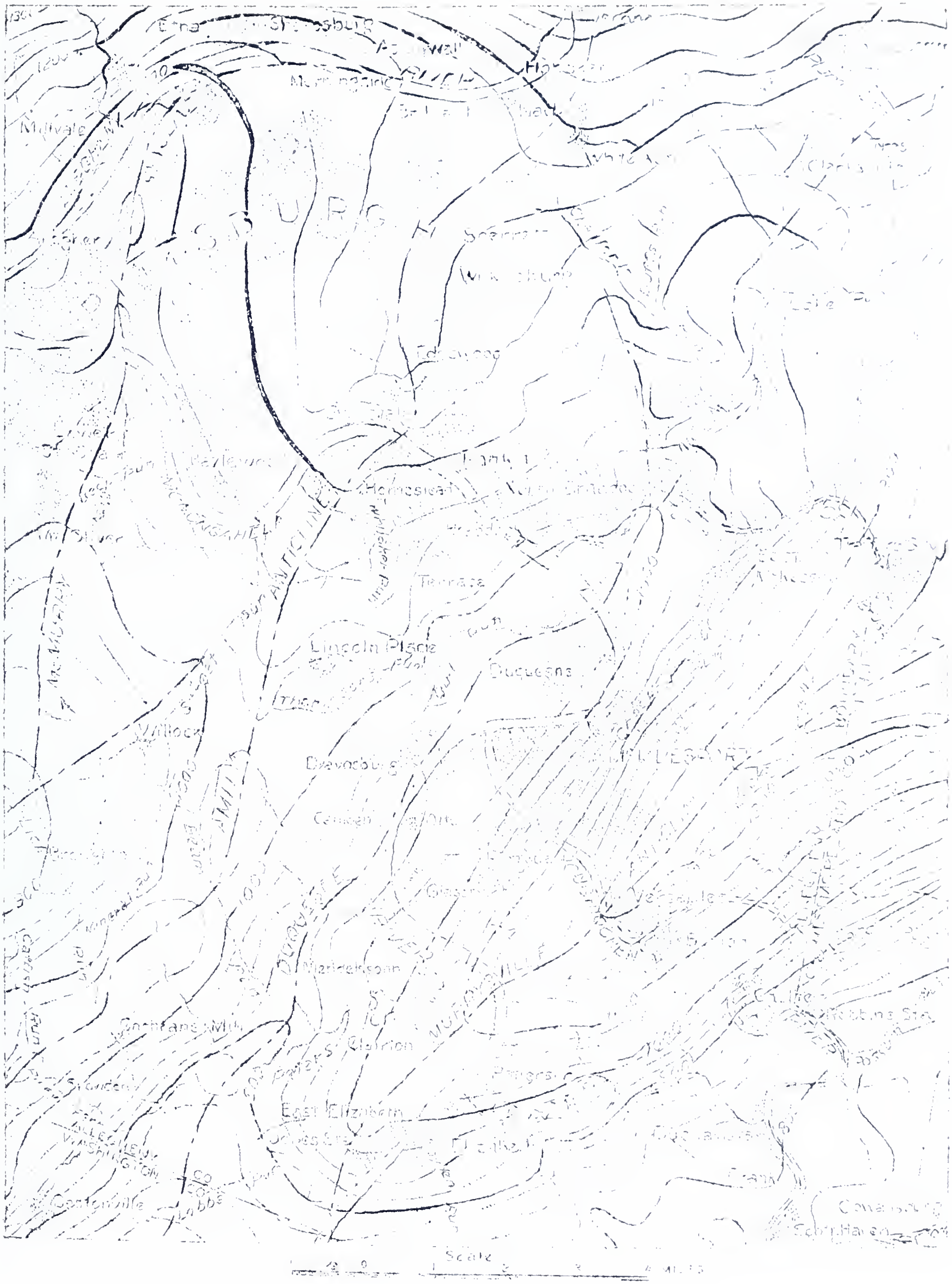
The outlook for further gas production is more favorable. The area north of Allegheny River (and within the confines of the quadrangle) is considered as unfavorable. Between the Allegheny and Monongahela Rivers and north of Turtle Creek there are several areas where small production might be obtained. The junction of Duff's Run and Chalfant Run is a favorable looking spot, but there would not be room for more than one or two wells. Another area where small production might be obtained is near the intersection of Rebecca Street

and Ardmore Boulevard (Lincoln Highway). Just east of where Beechwood Boulevard crosses Forbes Street there is another promising structure.

Between Turtle Creek and Youghiogheny River the ground has been so thoroughly drilled that practically every type of structure, favorable or unfavorable, has been tested. Similarly, all of the more favorable ground between the Youghiogheny and Monongahela Rivers has already been thoroughly tested.

West of the Monongahela there is still a little land untested but most of the more favorable territory has been drilled and has been producing gas for years. The cross-roads about 3/4 of a mile west-northwest of New England is the center of a small dome only partly tested. Farther north (about 2½ miles) there is room on the Jacob Miller and Jas. Hayes Estate for several wells. Just over the western edge of the quadrangle and 2½ miles south of Allegheny River there is a favorable structure which to the knowledge of the author has not yet been tested.

To sum up then, there is little chance of finding other oil pools in the Pittsburgh quadrangle and little prospect of discovering any more large gas pools. There *is*, however, a fair opportunity of extending some of the present gas pools and of discovering small gas pools in a few areas as yet untested.



PITTSBURGH QUADRANGLE - GEOLOGIC STRUCTURE SHEET

Structure contours on Pittsburgh coal.